

Claims

1. A well production tubular (2) having a longitudinal axis (4), a generally annular cross section across the longitudinal axis, a wellhead end (6), a well bottom end (8), and a plurality of influx ports (10) opening through a sidewall of the tubular to form a plurality of flow paths from an outer surface of the tubular to an inner surface of the tubular, said influx ports being formed through the sidewall at an obtuse angle B with respect to the longitudinal axis of the tubular in the direction of the wellhead end so that substantially all fluid flowing into the tubular exits the influx ports with a substantial axial velocity component toward the wellhead end of the tubular.
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2. A well production tubular as in claim 1 in which the sidewall has a thickness and the influx ports have a diameter which is less than about 1.5 times the thickness.
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3. A well production tubular as in claim 1 in which the sidewall has a thickness and the influx ports have a diameter which is less than about 1.0 times the thickness.
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4. A well production tubular as in claim 1 in which the sidewall has a thickness and the influx ports have a diameter which is less than about 0.5 times the thickness.
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5. A well production tubular (2') having a longitudinal axis (4'), a generally annular cross section across the longitudinal axis, a wellhead end (6'), a well bottom end (8'), and a plurality of influx ports (10') opening through the sidewall to form a plurality of flow paths from the outer surface of the tubular to the inner surface of the tubular, said influx ports being formed through the sidewall at an acute angle C with respect to a plane drawn through to the longitudinal axis of the tubular and passing through the port so that substantially all fluid flowing into the tubular exits the influx ports with a substantial rotational velocity component.
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6. A well production tubular as in claim 5 in which the sidewall has a thickness and the influx ports have a diameter which is less than three times the thickness.

5 7. A well production tubular as in claim 5 in which the sidewall has a thickness and the influx ports have a diameter which is less than two times the thickness.

8. A well production tubular as in claim 5 in which the sidewall has a thickness and the influx ports have a diameter which is less than the thickness.

10 9. A well production tubular as in claim 5 wherein the influx ports are arranged in a series of longitudinally separated banks (12') of influx ports, each bank containing a portion of the plurality.

15 10. A well (20) for the production of hydrocarbons, comprising
a borehole (22) extending into the earth from the surface of the earth into a hydrocarbon production zone (24), and

20 a well production tubular (2) positioned in the borehole, said well production tubular having a longitudinal axis, a generally annular cross section across the longitudinal axis, a wellhead end, a well bottom end, and a plurality of influx ports opening through a sidewall of the tubular along a segment (26) of the tubular positioned in the hydrocarbon production zone which form plurality of flow paths from an outer surface of the tubular to an inner surface of the tubular, said influx ports being formed through the sidewall at an obtuse angle with respect to the longitudinal axis of the tubular in the direction of the wellhead end so that substantially all hydrocarbon flowing from the hydrocarbon production zone and into the tubular exits the influx ports with a substantial axial velocity component toward the wellhead end of the tubular.

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11. A well as in claim 10 further comprising
a casing (28) which lines the borehole from the surface of the earth to the hydrocarbon production zone, said casing being positioned between the well production tubular and the earth and being perforated by perforations (30) in the hydrocarbon production zone to permit hydrocarbon to flow from the earth, through the casing, into the well production tubular and to the surface of the earth.

12. A well as in claim 11 wherein an annulus (32) is formed between the casing and the well production tubular.

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13. A well as in claim 12 further comprising a packer (34) sealingly positioned in the annulus spaced apart from the hydrocarbon production zone to channel hydrocarbon flow from the hydrocarbon production zone, through the influx ports, and into the production tubular.

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14. A concentric tubing and mounting system (102) for use in completing a well (104), said system comprising
a tubular member (106) having an inlet end, an outlet end, and a longitudinal axis extending between the ends,

20 a first mounting device (108) positioned on an outside surface of the tubular member near the inlet end of the tubular member for mounting the inlet end of the tubular member on an inside surface of a well production tubing (110);
a second mounting device (112) positioned on an outside surface of the tubular member near the outlet end of the tubular member for mounting the outlet end of the tubular member to the inside surface of a well production tubing.

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15. A concentric tubing and mounting system as in claim 14 wherein the first mounting device is annularly shaped and is selectively expandable for setting securely against an inside of a well production tubing.

16. A concentric tubing and mounting system as in claim 14 wherein the second mounting device defines a plurality of flow paths to permit fluid flow through the mounting device in a direction parallel to the longitudinal axis of the tubular member.

5 17. A concentric tubing and mounting system as in claim 14 further comprising a converging inlet element (114) positioned on the inlet end of the tubular member to provide a smoothly narrowing fluid flow path from an inside surface of a well production tubing to the inside of the tubular member.

10 18. A well (124) for the production of hydrocarbons, comprising
a borehole extending into the earth from a wellhead at the surface of the earth and into
a hydrocarbon production zone (125),

15 a production tubing (130) positioned in the borehole and extending into the
hydrocarbon production zone from the wellhead,

20 said production tubing having a first perforated section (140) positioned in the
hydrocarbon production zone and a second perforated section (142) positioned
between the first perforated section and the wellhead,

a completion tubing (126) having an inlet end, an outlet end, and a longitudinal axis
extending between the ends,

25 a first mounting device (128) positioned on an outside surface of the completion
tubing near the inlet end of the completion tubing mounting the inlet end of the
completion tubing to an inside surface of the production tubing between the first
perforated section and the second perforated section, and

a second mounting device (132) positioned on the outside surface of the completion tubing near the outlet end of the completion tubing mounting the outlet end of the completion tubing to the inside surface of the well production tubing between the second perforated section and the wellhead,

5 whereby fluid flowing into the production tubing through the perforations of the second perforated section flows into an annulus defined between the completion tubing and the production tubing.

10 19. A well as in claim 18 wherein the second perforated section is positioned in the first production zone.

20. A well as in claim 18 wherein the second perforated section is positioned in a second production zone (125').

15 21. A well as in claim 18 wherein

20 the hydrocarbon production zone constitutes a first hydrocarbon production zone (125), and the borehole further extends through a second hydrocarbon production zone (125') positioned between the first hydrocarbon production zone and the wellhead,

the production tubing further has a third perforated section (142') positioned between the second perforated section and the wellhead alongside the second hydrocarbon production zone,

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and the completion tubing constitutes a first completion tubing,

said well further comprising

a second completion tubing (126') positioned between the first completion tubing and the wellhead, said second completion tubing having an inlet end, an outlet end, and a longitudinal axis extending between the ends;

5 a first mounting device (128') positioned on an outside surface of the second completion tubing near the inlet end of the second completion tubing mounting the inlet end of the second completion tubing on an inside surface of the production tubing between the second perforated section and the third perforated section, and a second mounting device (132') positioned on the outside surface of the second completion tubing near the outlet end of the second completion tubing mounting the outlet end of the second completion tubing to the inside surface of the well production tubing between the third perforated section and the wellhead,

10 whereby fluid flowing into the production tubing through the perforations of the third perforated section flows into an annulus defined between the completion tubing and the production tubing.

15 22. A well (202) for the production of hydrocarbons, comprising

a well bore (204) extending into the earth from the surface of the earth into a hydrocarbon production zone (206), and

20 a well bore casing (208) positioned in the borehole, said well bore casing having a longitudinal axis, a generally annular cross section across the longitudinal axis, a wellhead end, a well bottom end, and a plurality of perforations (210) opening through a sidewall of the casing along a segment of the casing positioned in the hydrocarbon production zone which form plurality of flow paths from an outer surface of the casing to an inner surface of the casing, said perforations being formed through the sidewall at an obtuse angle D with respect to the longitudinal axis of the casing in the direction of the wellhead end so that substantially all hydrocarbon flowing from

the hydrocarbon production zone and into the casing exits the perforations with a substantial axial velocity component toward the wellhead end of the casing.

23. A well as in claim 22 further comprising

5 a cement layer (212) which lines the wellbore at least across the hydrocarbon production zone, said cement layer being positioned between the well bore casing and the earth and being perforated by the perforations to permit hydrocarbon to flow from the earth, though the cement layer, into the well bore casing and to the surface of the earth.

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24. A well as in claim 23 wherein the cement is positioned in an annulus between the casing and the well bore.

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25. A well as in claim 22 which is highly deviated from vertical in the production zone.

26. A well as in claim 22 wherein the well bore casing is substantially imperforate apart from the segment of the casing positioned in the hydrocarbon production zone.